ATTY DOCKET NO.
137264

DOC. ID
137264B

IN THE CLAIMS:

Please amend the Claims as follows:

Claim 1. (currently amended) A turbine shroud assembly cooling element comprising:

an arcuate <u>turbine shroud</u> panel circumscribed about an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel <u>from a radially outer surface to a radially inner surface</u>,

<u>the apertures having aperture inlets on the radially outer surfaces and aperture outlets on the radially inner surface,</u>

an axially extending midline of the panel parallel to the axis of rotation,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets that is symmetric with respect to the axially extending midline, and

an asymmetric portion of the cooling apertures having an asymmetrical density of <u>the</u> aperture inlets that is asymmetric with respect to the axially extending midline.

Claim 2. (original) A cooling element as claimed in Claim 1 further comprising a high density area of the cooling apertures in the asymmetric portion of the cooling apertures and the high density area having a higher density of aperture inlets than in the symmetric portion of the cooling apertures.

Claim 3. (original) A cooling element as claimed in Claim 2 further comprising a low density area of the cooling apertures

in the asymmetric portion of the cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the cooling apertures.

Claim 4. (original) A cooling element as claimed in Claim 1 further comprising the high density area of the cooling apertures located in a wake region of the arcuate panel.

Claim 5. (original) A cooling element as claimed in Claim 4 further comprising a high density area of the cooling apertures in the asymmetric portion of the cooling apertures and the high density area having a higher density of aperture inlets than in the symmetric portion of the cooling apertures.

Claim 6. (original) A cooling element as claimed in Claim 5 further comprising a low density area of the cooling apertures in the asymmetric portion of the cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the cooling apertures.

Claim 7. (currently amended) ~~A cooling element as claimed in Claim 1 wherein the cooling element is a baffle and the cooling apertures are impingement apertures.~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribed about an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation wherein the cooling element is a baffle and

the cooling apertures are impingement apertures,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets that is symmetric with respect to the axially extending midline, and

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets that is asymmetric with respect to the axially extending midline.

Claim 8. (original) A cooling element as claimed in Claim 7 further comprising a high density area of the impingement apertures in the asymmetric portion of the impingement apertures and the high density area having a higher density of aperture inlets than in the symmetric portion of the impingement apertures.

Claim 9. (original) A cooling element as claimed in Claim 8 further comprising a low density area of the impingement apertures in the asymmetric portion of the impingement apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the impingement apertures.

Claim 10. (original) A cooling element as claimed in Claim 1 wherein the cooling element is a shroud segment, the arcuate panel is a base, and the cooling apertures are convection cooling apertures.

Claim 11. (original) A cooling element as claimed in Claim 10 further comprising a high density area of the impingement cooling apertures in the asymmetric portion of the convection cooling apertures and the high density area having a higher

density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 12. (original) A cooling element as claimed in Claim 11 further comprising a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 13. (original) A cooling element as claimed in Claim 10 further comprising the high density area of the convection cooling apertures located in a wake region of the arcuate panel of the shroud segment.

Claim 14. (original) A cooling element as claimed in Claim 13 further comprising a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 15. (original) A cooling element as claimed in Claim 14 further comprising a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 16. (previously presented) A cooling element as claimed in Claim 15 wherein a first portion of the convection

cooling apertures are axially angled forwardly with respect to the axis of rotation.

Claim 17. (original) A cooling element as claimed in Claim 16 wherein a second portion of the convection cooling apertures are axially angled rearwardly with respect to the axis of rotation.

Claim 18. (currently amended) ~~A cooling element as claimed in Claim 17 wherein~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribing an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets being symmetric with respect to the axially extending midline,

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets being asymmetric with respect to the axially extending midline,

the cooling element being a shroud segment, the arcuate panel being a base, and the cooling apertures being convection cooling apertures,

the high density area of the convection cooling apertures being located in a wake region of the arcuate panel of the shroud segment,

a high density area of the convection cooling apertures in

the asymmetric portion of the convection cooling apertures,

the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a first portion of the convection cooling apertures being axially angled forwardly with respect to the axis of rotation, a second portion of the convection cooling apertures being axially angled rearwardly with respect to the axis of rotation, and

a third portion of the convection cooling apertures ~~are~~ being circumferentially angled in a clockwise direction with respect to the midline of the base.

Claim 19. (currently amended) ~~A cooling element as claimed in Claim 17 wherein~~ A turbine shroud assembly cooling element comprising:

an arcuate turbine shroud panel circumscribing an axis of rotation and having opposite axially spaced apart forward and aft ends,

a plurality of cooling apertures extending through the panel,

an axially extending midline of the panel parallel to the axis of rotation,

a symmetric portion of the cooling apertures having a symmetrical density of aperture inlets being symmetric with respect to the axially extending midline,

an asymmetric portion of the cooling apertures having an asymmetrical density of aperture inlets being asymmetric with respect to the axially extending midline,

the cooling element being a shroud segment, the arcuate panel being a base, and the cooling apertures being convection cooling apertures,

the high density area of the convection cooling apertures being located in a wake region of the arcuate panel of the shroud segment,

a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures,

the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures,

a first portion of the convection cooling apertures being axially angled forwardly with respect to the axis of rotation, a second portion of the convection cooling apertures being axially angled rearwardly with respect to the axis of rotation, and

a fourth portion of the convection cooling apertures ~~are~~ being circumferentially angled in a counter-clockwise direction with respect to the midline of the base.

Claim 20. (previously presented) A turbine shroud assembly comprising:

a plurality of arcuate shroud segments circumferentially

disposed about an engine centerline axis,

each of the shroud segments including a base having a radially outer back surface, a radially inner front surface, and opposite axially spaced apart upstream and downstream ends,

a plurality of angled elongated convection cooling apertures extending through the base with convection aperture inlets at the back surface and aperture outlets at the radially inner front surface,

a plurality of arcuate hanger segments supporting the shroud segments and secured to a gas turbine engine outer casing,

a shroud chamber radially disposed between each of the hanger segments and bases,

a pan-shaped baffle radially disposed in the shroud chamber between each of the hanger segments and bases and defining a baffle plenum in the shroud chamber and radially outwardly of the baffle,

a metering hole disposed through each of the hanger segments and leading to the baffle plenum,

a plurality of impingement apertures having impingement aperture inlets through a panel of the baffle and generally oriented towards the base, the panel being radially spaced apart from and generally concentric with the base,

parallel axially extending midlines of the panel and the base, the midlines being parallel to the engine centerline axis, and

asymmetric portions of the cooling apertures having asymmetrical densities of aperture inlets that are asymmetric with respect to the axially extending midlines.

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Claim 21. (currently amended) ~~An assembly as claimed in Claim 20 further comprising~~ A turbine shroud assembly comprising:

a plurality of arcuate shroud segments circumferentially disposed about an engine centerline axis,

each of the shroud segments including a base having a radially outer back surface, a radially inner front surface, and opposite axially spaced apart upstream and downstream ends,

a plurality of angled elongated convection cooling apertures extending through the base with convection aperture inlets at the back surface and aperture outlets at the radially inner front surface,

a plurality of arcuate hanger segments supporting the shroud segments and secured to a gas turbine engine outer casing,

a shroud chamber radially disposed between each of the hanger segments and bases,

a pan-shaped baffle radially disposed in the shroud chamber between each of the hanger segments and bases and defining a baffle plenum in the shroud chamber and radially outwardly of the baffle,

a metering hole disposed through each of the hanger segments and leading to the baffle plenum,

a plurality of impingement apertures having impingement aperture inlets through a panel of the baffle and generally oriented towards the base, the panel being radially spaced apart from and generally concentric with the base,

parallel axially extending midlines of the panel and the base, the midlines being parallel to the engine centerline axis,

asymmetric portions of the cooling apertures having asymmetrical densities of aperture inlets that are asymmetric with respect to the axially extending midlines,

a high density area of the impingement apertures in the asymmetric portion of the impingement apertures, and

the high density area having a higher density of aperture inlets than in a symmetric portion of the impingement apertures.

Claim 22. (original) An assembly as claimed in Claim 21 further comprising a low density area of the impingement apertures in the asymmetric portion of the impingement apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the impingement apertures.

Claim 23. (previously presented) An assembly as claimed in Claim 20 further comprising a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the high density area having a higher density of aperture inlets than a symmetric portion of the convection cooling apertures.

Claim 24. (original) An assembly as claimed in Claim 23 further comprising a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 25. (original) An assembly as claimed in Claim 20

further comprising the high density area of the convection cooling apertures located in a wake region of the arcuate panel of the shroud segment.

Claim 26. (previously presented) An assembly as claimed in Claim 25 further comprising a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the high density area having a higher density of aperture inlets than in a symmetric portion of the convection cooling apertures.

Claim 27. (original) An assembly as claimed in Claim 26 further comprising a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 28. (previously presented) An assembly as claimed in Claim 27 wherein a first portion of the convection cooling apertures are axially angled upstream.

Claim 29. (original) An assembly as claimed in Claim 28 wherein a second portion of the convection cooling apertures are axially angled downstream.

Claim 30. (previously presented) An assembly as claimed in Claim 25 further comprising a high density area of the impingement apertures in the asymmetric portion of the impingement apertures and the high density area having a higher density of aperture inlets than in a symmetric portion

of the impingement apertures.

Claim 31. (original) An assembly as claimed in Claim 30 further comprising a low density area of the impingement apertures in the asymmetric portion of the impingement apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the impingement apertures.

Claim 32. (original) An assembly as claimed in Claim 31 further comprising a high density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the high density area having a higher density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 33. (original) An assembly as claimed in Claim 32 further comprising a low density area of the convection cooling apertures in the asymmetric portion of the convection cooling apertures and the low density area having a lower density of aperture inlets than in the symmetric portion of the convection cooling apertures.

Claim 34. (previously presented) An assembly as claimed in Claim 33 wherein a first portion of the convection cooling apertures are axially angled upstream.

Claim 35. (original) An assembly as claimed in Claim 34 further comprising the high density area of the impingement apertures located radially outwardly and circumferentially aligned with the convection cooling apertures located in the

wake region of the shroud segment.